



Stock Market Volatility And The Application Of Volatility Trading Models - Using By 'R' Application

Prof. M. Madana Mohan, M.Com, MBA, MPhil, PhD & Principal, Vishwa Vishwani School of Business, Thumkunta Vil., Near Hakimpet, Hyderabad -78

Dr. P. Chakravarthi, M.A (Eco.)MBA, PhD, Director-Integrated MBA, Vishwa Vishwani Institute of Systems and Management, Thumkunta Vil., Near Hakimpet, Hyderabad -78

T. Srinivas Acharya, Ph.D. Scholar, Dept. of Commerce & Business Management, Kakatiya University, Warangal, Telangana State

Abstract

In this paper, we have examined the effects of price limits on the stock volatility in the Indian Stock Exchange. Results indicate the dominance of TVS company price volatility on real stock returns and emphasize how this has increased over time. This paper examines behavior of stock return volatility in the Indian stock exchange market phases for the TVS Motors share index. A price series or an economic indicator that changes a lot and swings wildly is said to be "volatile". The research covers a sample of one company i.e. TVS Motors share price movements using monthly data from 31st March, 2015 to 31st March, 2016. The study found that there is an increasing in both trading volume and stock price volatility, which may be considered as a recent phenomenon in the majority of the Indian stock market. This is difficult, if not impossible, because we cannot say that volatility is necessarily stochastic or that it conforms to any mathematical model; all we know is that the evolution of volatility is uncertain. An accurate estimate of volatility is, however, crucial in many applications, including risk measurement and management as well as option pricing and hedging. We expand the application 'R' model by examining the dynamics of out of sample causality through the variance decomposition and impulse response function techniques.

Key words: volatility of share price, , Volatility Vs direction, Application of 'R', Statistical Tools.

Introduction: Stock prices change every day as a result of market forces. By this we mean that share prices change because of supply and demand. If more people want to buy a stock (demand) than sell it (supply), then the price moves up. Conversely, if more people wanted to sell a stock than buy it, there would be greater supply than demand, and the price would fall. Understanding supply and demand is easy. What is difficult to

comprehend is what makes people like a particular stock and dislike another stock. This comes down to figuring out what news is positive for a company and what news is negative. There are many answers to this problem and just about any investor you ask has their own ideas and strategies.

The most important factor that affects the value of a company is its earnings. Earnings are the profit a company makes,



and in the long run no company can survive without them. It makes sense when you think about it. If a company never makes money, it isn't going to stay in business. Public companies are required to report their earnings four times a year (once each quarter). Wall Street watches with rabid attention at these times, which are referred to as earnings seasons. The reason behind this is that analysts base their future value of a company on their earnings projection. If a company's results surprise (are better than expected), the price jumps up. If a company's results disappoint (are worse than expected), then the price will fall.

Volatility: In finance, **volatility** is the degree of variation of a trading price series over time as measured by the standard deviation of returns. Historic volatility is derived from time series of past market prices. An implied volatility is derived from the market price of a market traded derivative (in particular an option). The symbol σ is used for volatility, and corresponds to standard deviation, which should not be confused with the similarly named variance, which is instead the square, σ^2 .

Volatility for investors: Investors care about volatility for seven reasons:

The wider the swings in an investment's price, the harder emotionally it is to not worry;

Price volatility of a trading instrument can define position sizing in a portfolio;

When certain cash flows from selling a security are needed at a specific future date, higher volatility means a greater chance of a shortfall;

Higher volatility of returns while saving for retirement results in a wider

distribution of possible final portfolio values;

Higher volatility of return when retired gives withdrawals a larger permanent impact on the portfolio's value;

Price volatility presents opportunities to buy assets cheaply and sell when overpriced;

Volatility affects pricing of options, being a parameter of the Black-Scholes model.

In today's markets, it is also possible to trade volatility directly, through the use of derivative securities such as options and variance swaps. See Volatility arbitrage.

Volatility versus direction: Volatility does not measure the direction of price changes, merely their dispersion. This is because when calculating standard deviation (or variance), all differences are squared, so that negative and positive differences are combined into one quantity. Two instruments with different volatilities may have the same expected return, but the instrument with higher volatility will have larger swings in values over a given period of time.

Volatility over time: Although the Black-Scholes equation assumes predictable constant volatility, this is not observed in real markets, and amongst the models are Emanuel Derman and Iraj Kani's and Bruno Dupire's Local Volatility, Poisson Process where volatility jumps to new levels with a predictable frequency, and the increasingly popular Heston model of stochastic volatility. It is common knowledge that types of assets experience periods of high and low volatility. That is, during some periods, prices go up and down quickly, while during other times they barely move at all.



Need for the Study: The study is mainly to know the cause of change in share price status of TVS Company in the market. Stock prices change every day as a result of market forces. By this we mean that share prices change because of supply and demand. If more people want to buy a stock (demand) than sell it (supply), then the price moves up. Conversely, if more people wanted to sell a stock than buy it, there would be greater supply than demand, and the price would fall. It basically to see where the loop wholes of the company are so that to take preferable measures to overcome them. It is the study of Share Price Movements of the TVS Company through Technical Analysis. The technical approach to investment is essentially a reflection of the idea that prices move in trends, which are determined by the changing attitudes of investors toward a variety of economic, monetary, political, and psychological forces. The art of technical analysis is to identify trend changes at an early stage and to maintain an investment posture until the weight of the evidence indicates that the trend has reversed.

Human nature remains more or less constant and tends to react to similar situations in consistent ways. By studying the nature of previous market turning points, it is possible to develop some characteristics that can help to identify major market tops and bottoms. Technical analysts believe that they can accurately predict the future price of a stock by looking at its historical prices and other trading variables by 'R' application. Technical analysts have developed an arsenal of tools to help isolate these points. The technician believes that forces of supply and demand are reflected in patterns of price and volume of trading.

Scope of the study: The study provides the information regarding the share price movements. It helps the evaluator to check the market conditions under which the share prices are evaluated by 'R' application. The study analyzed considers the mission of the company and wealth maximization concept of the investor.

Objectives of the study: The main objectives of study are to study the effectiveness of share price status of TVS Motors Company. To forecast the share prices movement based on the market conditions, evaluate the areas that helps the investor to take an investment decision, obtain various market indicators and identify the relative strength index and moving averages. To determine the relationship between the share price movements, Risk and the returns evaluated by 'R' application for the TVS motors company

Methodology of the study: The data collected for the study includes both **primary data** and **secondary data**. The data used in the project is mostly secondary data which is taken from the website www.nseindia.com. The sample size of the study is share price data of TVS motors and period of details analyzed in the study is one year i.e. 23rd March, 2015 to 23rd March, 2016.

Tools used in the study (Statistical tools through 'R' application)

Plots, Previous Close, Open Price, High Price, Low Price, Last Price, Close Price, Average Price, Total Trade Quantity, Turnover in Lakhs, Deliverable Quantity, % of Delivery Quantity to Traded Quantity, Returns, Histograms, skewed right, Skewed Left, Skewness, Kurtosis, % of Delivery Quantity to Traded Quantity, Seasonality, Bivariate, Correlation and Autocorrelation



Research instrument: Application 'R':

Statistical learning refers to a vast set of tools for understand data. These tools can be classified as supervised or unsupervised. Broadly speaking, supervised statistical learning involves building a statistical model for predicting, or estimating, an output based on one or more inputs. Problems of this nature occur in fields as diverse as business, medicine, astrophysics, and public policy. With unsupervised statistical learning, there are inputs but no supervising output; nevertheless, we can learn relationships and structure from such data. To illustrate statistical learning in this project, we used the supervised tool called the application 'R'.

Limitations of The Study: The limitations of the study are those characteristics of design or methodology that impacted or influenced the application or interpretation of the results of your study. They are the constraints on generalizability and utility of findings that are the result of the ways in which you chose to design the study and/or the method used to establish internal and external validity.

Below are some of the limitations of this particular project

- The study is purely based on secondary data.
- In this study with the application 'R' we used only five dimensions namely data summary, plots, histograms, seasonality, bivariate.
- The study is purely based on one company (TVS Company).
- Only for bivariate used two company's data.

Company Profile: TVS Motor Company is the third largest two-wheeler manufacturer in India, with a revenue of Rs.10,131 Cr (\$1.5 billion) in 2014-15. It is the flagship company of the Rs. 40,000 Cr (\$6 billion, in 2014-15) TVS Group. The company has an annual sales of 2.5 million units and an annual capacity of over 3 million vehicles. TVS Motor Company is also the 2nd largest exporter in India with exports to over 60 Countries. TVS Motor Company Ltd (TVS Motor), member of the TVS Group, is the largest company of the group in terms of size and turnover, with more than 2.8 crore customers riding a TVS bike.

Conceptual Theories (Application of 'R'):

Though the term statistical learning is fairly new, many of the concepts that underlie the field were developed long ago. At the beginning of the nineteenth century, Legendre and Gauss published papers on the method of least squares, which implemented the earliest form of what is now known as linear regression. The approach was first successfully applied to problems in astronomy. Linear regression is used for predicting quantitative values, such as an individual's salary. In order to predict qualitative values, such as whether a patient survives or dies, or whether the stock market increases or decreases, Fisher proposed linear discriminant analysis in 1936. In the 1940s, various authors put forth an alternative approach, logistic regression. In the early 1970s, Nelder and Wedderburn coined the term generalized linear models for an entire class of statistical learning methods that include both linear and logistic regression as special cases. By the end of the 1970s, many more techniques for learning from data were available. However, they were almost exclusively



linear methods, because fitting non-linear relationships was computationally infeasible at the time. By the 1980s, computing technology had finally improved sufficiently that non-linear methods were no longer computationally prohibitive.

What is Statistical Learning: In order to motivate our study of statistical learning, we begin with a simple example. Suppose that we are statistical consultants hired by a client to provide advice on how to improve sales of a particular product. The Advertising data set consists of the sales of that product in 200 different markets, along with advertising budgets for the product in each of those markets for three different media: TV, radio, and newspaper. It is not possible for our client to directly increase sales of the product. On the other hand, they can control the advertising expenditure in each of the three media. Therefore, if we

determine that there is an association between advertising and sales, then we can instruct our client to adjust advertising budgets, thereby indirectly increasing sales. In other words, our goal is to develop an accurate model that can be used to predict sales on the basis of the three media budgets.

How it works (application 'R'): In the editor on the right you should type R code to solve the exercises. When you hit the 'Submit Answer' button, every line of code is interpreted and executed by R and you get a message whether or not your code was correct. The output of your R code is shown in the console in the lower right corner. R makes use of the # sign to add comments, so that you and others can understand what the R code is about. Just like Twitter! Comments are not run as R code, so they will not influence your result. For example, *Calculate 3 + 4* in the editor on the right is a comment.

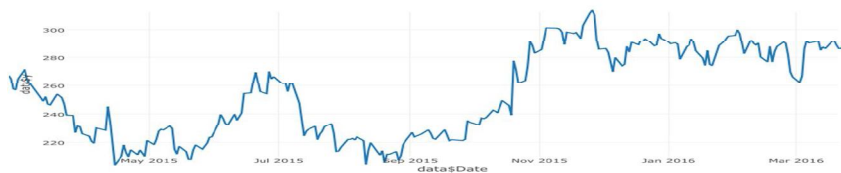
Data analysis and Interpretations

	Date	Close Price	Average Price	Total. Traded. Quantity	Turnover in Lacs	No. of Trades	Deliverable Qty	X. Dly Qt to Traded Qty	Returns
1	Min. : 2015-03-23	Min. : 215.3	Min. : 214.5	Min. : 412384	Min. : 976.3	Min.: 5648	Min.: 85882	Min : 12.35	Min. : -0.0599128
2	1st Qu.: 2015-06-22	1st Qu.: 232.2	1st Qu.: 232.9	1st Qu.: 981192	1st Qu.: 2442.3	1 st Qu.: 14007	1st Qu.: 287173	1st Qu.: 26.55	1 st Qu.: -0.0117562
3	Median : 2015-09-17	Median : 256.2	Median : 256.3	Median : 1342984	Median : 3515.9	Median : 10469	Median : 454621	Median : 39.73	Median:-0.0006704
4	Mean : 2015-09-20	Mean : 257.2	Mean : 257.2	Mean: 1759241	Mean: 4547.6	Mean: 22693	Mean: 650680	Mean : 35.16	Mean: 0.0007971
5	3rd Qu.: 2015-12-21	3rd Qu.: 284.1	3rd Qu.: 283.7	3 rd Qu.: 2070113	3rd Qu.: 5465.5	3 rd Qu.: 27977	3rd Qu.: 793639	3 rd Qu.: 41.01	3rd Qu.: 0.0120628
6	Max. : 2016-03-21	Max. : 307.0	Max. : 307.5	Max. : 12287024	Max. : 32816.7	Max. : 118084	Max. : 3272694	Max. : 77.15	Max.: 0.1311542

Plots

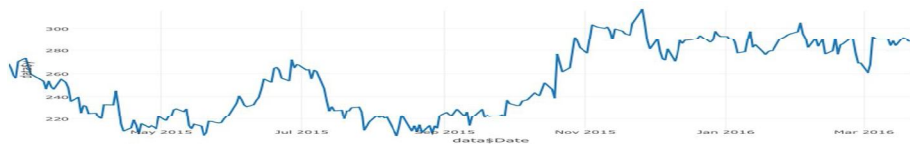
Previous Close

Chart No: 1a



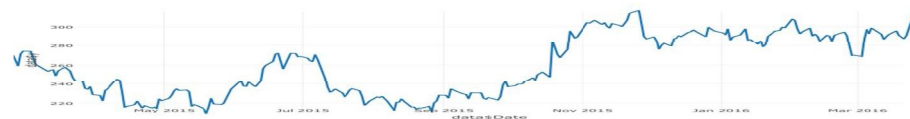
Interpretation This is a line graph. The title of the chart is "Previous close Price of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 220.0 and ends at 300.0. There is only 1 series in this graph. The vertical axis is Index. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 309.8 occurring on 1 Dec 2015. The minimum value is 216.6 occurring on 25 Aug 2015.

Open Price **Chart No: 2a**



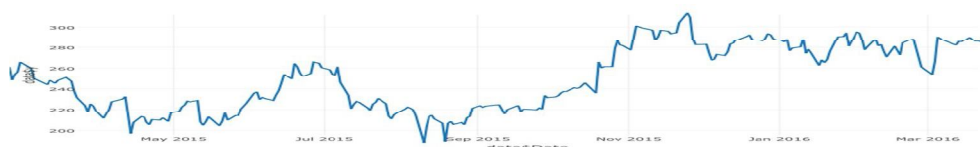
Interpretation There are in total 249 categories in the horizontal axis. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. This is a line graph. The title of the chart is "Open Price of TVS motors ". The vertical axis starts at 220.0 and ends at 300.0. There is only 1 series in this graph. The vertical axis is Index. The maximum value is 306.9 occurring on 30 Nov 2015. The minimum value is 216.6 occurring on 25 Aug 2015.

High Price **Chart No: 3a**



Interpretation The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. This is a line graph. The title of the chart is "High Price of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 220.0 and ends at 300.0. There is only 1 series in this graph. The vertical axis is Index. The maximum value is 309.8 occurring on 1 Dec 2015. The minimum value is 209.8 occurring on 9 June 2015.

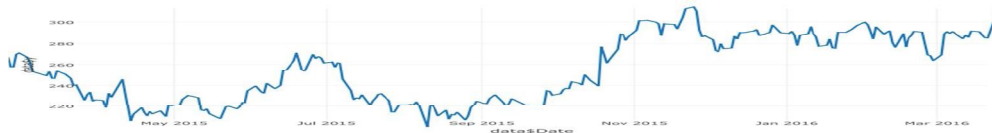
Low Price **Chart No: 4a**





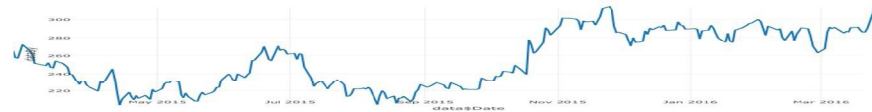
Interpretation The title of the chart is "Low Price of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 220.0 and ends at 300.0. The vertical axis is Index. This is a line graph. There is only 1 series in this graph. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 305.6 occurring on 30 Nov 2015. The minimum value is 201 occurring on 24 Aug 2015.

Last Price **Chart No: 5a**



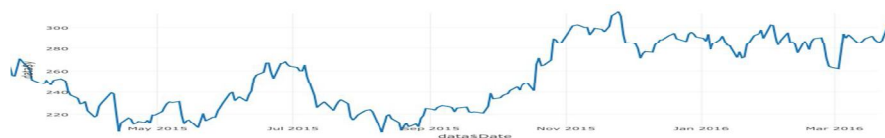
Interpretation The vertical axis is Index. The vertical axis starts at 220.0 and ends at 300.0. This is a line graph. The title of the chart is "Last Price of TVS motors ". There are in total 249 categories in the horizontal axis. There is only 1 series in this graph. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 307 occurring on 30 Nov 2015. The minimum value is 212 occurring on 24 Aug 2015.

Close Price **Chart No: 6a**



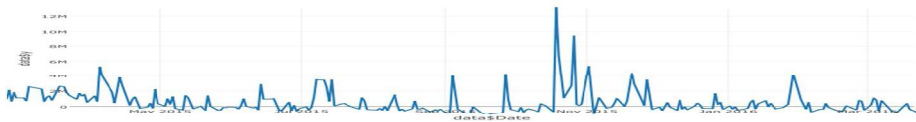
Interpretation: This is a line graph. The title of the chart is "Close Price of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 220.0 and ends at 300. There is only 1 series in this graph. The vertical axis is Index. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 307 occurring in 30 Nov 2015. The minimum value is 215.3 occurring on 7 May 2015.

Average Price **Chart No: 7a**



Interpretation: There are in total 249 categories in the horizontal axis. This is a line graph. The title of the chart is "Close Price of TVS motors. There is only 1 series in this graph. The vertical axis is Index. ". The vertical axis starts at 220.0 and ends at 300.0. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 307.51 occurring in 30 Nov 2015. The minimum value is 214.53 occurring on 24 Aug 2015.

Total Trade Quantity **Chart No: 8a**



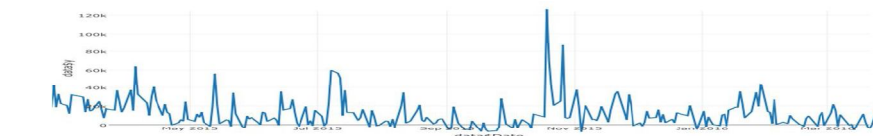
Interpretation: The title of the chart is "Total Trade Quantity of TVS motors ". The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. This is a line graph. There are in total 249 categories in the horizontal axis. The vertical axis starts at 0 and ends at 12M. There is only 1 series in this graph. The vertical axis is Index. The maximum value is 12.28702M occurring on 27 Oct 2015. The minimum value is 423.877k occurring on 1 Oct 2015.

Turnover in Lakhs Chart No: 9a



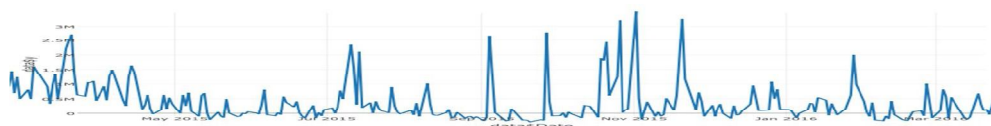
Interpretation: The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 32.81671k occurring on 27 Oct 2015. The minimum value is 976.28 occurring on 1 Oct 2015. This is a line graph. The title of the chart is "Turn over in Lakhs of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 0 and ends at 30k. There is only 1 series in this graph. The vertical axis is Index.

Number of Trades Chart No: 10a



Interpretation: The vertical axis is Index. The vertical axis starts at 0 and ends at 120k. There is only 1 series in this graph. This is a line graph. The title of the chart is "Number of Trades of TVS motors ". There are in total 249 categories in the horizontal axis. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 118.084k occurring on 27 Oct 2015. The minimum value is 6123 occurring on 1 Oct 2015.

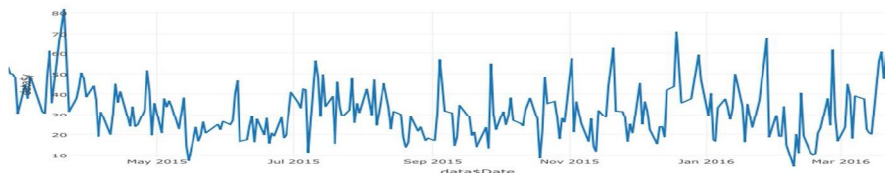
Deliverable Quantity Chart No: 11a





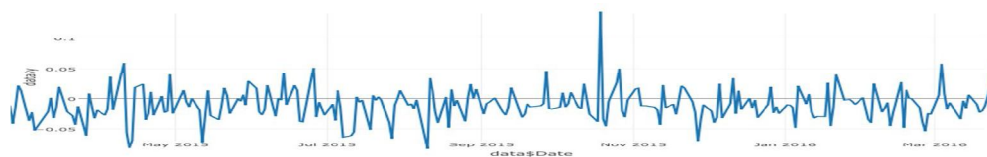
Interpretation: There are in total 249 categories in the horizontal axis. The vertical axis starts at 0 and ends at 3M. There is only 1 series in this graph. The vertical axis is Index. This is a line graph. The title of the chart is "Deliverable Quantity of TVS motors ". The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 3.272694M occurring on 9 Nov 2015. The minimum value is 85.882k occurring on 1 Oct 2015.

% of Delivery Quantity to Traded Quantity Chart No: 12a



Interpretation: This is a line graph. The title of the chart is "% of Delivery Quantity to Traded Quantity of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 10 and ends at 80. There is only 1 series in this graph. The vertical axis is Index. The units of the horizontal axis are date, months by year, ranging from 23 march 2015 to 21 march 2016. The maximum value is 77.15 occurring on 15 Apr 2015. The minimum value is 12.35 occurring on 8 Feb 2016.

Returns Chart No: 13a



Interpretation: There is only 1 series in this graph. The vertical axis is Index. This is a line graph. The title of the chart is "Returns of TVS motors ". There are in total 249 categories in the horizontal axis. The vertical axis starts at 0 and ends at 0.1. The units of the horizontal axis are date, months by year, ranging from 23 March 2015 to 21 March 2016. The maximum value is 0.1311542 occurring on 9 Nov 2015. The minimum value is -0.05991285 occurring on 24 Aug 2015.

Histograms One of the features that a histogram can show you is the shape of the statistical data- in other words, the manner in which the data fall into groups. For example, all the data may be exactly the same, in which case the histogram is just one tall bar; or the data might have an equal number in each group, in which case the shape is flat.

Some data sets have a distinct shape. Here are three shapes that stand out:

- **Symmetric.** A histogram is symmetric if you cut it down the middle and the left-hand and right-hand sides resemble mirror images of each other. It represents the

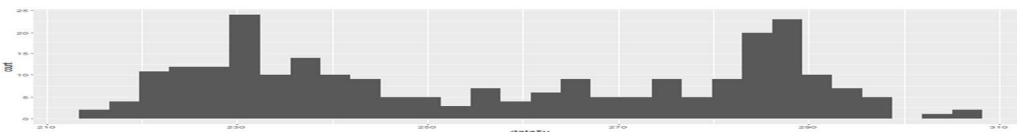


amount of time each of 50 survey participants took to fill out a certain survey. You see that the histogram is close to symmetric.

Skewed right. A skewed right histogram looks like a lopsided mound, with a tail going off to the right. Which shows the ages of the Best Actress Academy Award winners, is skewed right. You see on the right side there are a few actresses whose ages are older than the rest. Most of the actresses were between 20 and 50 years of age when they won. A few actresses were between 60–65 years of age when they won their Oscars, and a handful were 70 years or older. The last three bars are what make the data have a shape that is skewed right.

Previous Close

Chart No: 1a



Interpretation: Statistical summary of the variable:

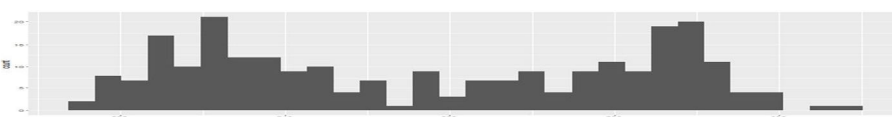
Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
215.3	232.2	256.2	257.1	283.8	307

The **SKEWNESS** of selected variable: 0.07212356: Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: -1.508081: Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. And is uniform distribution

Open Price

Chart No: 2a



Interpretation: Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
216.6	232.5	256.9	257.4	283.8	309.8

The **SKEWNESS** of selected variable: 0.0699904

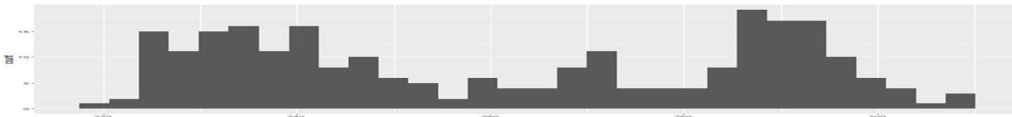
Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.



The **KURTOSIS** of the selected variable: -1.488165

Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. It is a uniform distribution.

High Price **Chart No: 3a**



Interpretation: Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
220.3	236.6	260.3	261.7	288	309.8

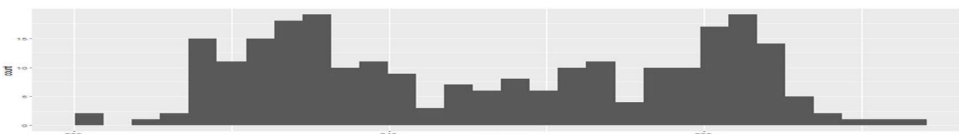
The **SKEWNESS** of selected variable: 0.06102605

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: -1.524024

Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. And is uniform distribution.

Low Price **Chart No: 4a**



Interpretation: Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
201.0	228.7	251.1	252.6	278.8	305.6

The **SKEWNESS** of selected variable: 0.07771572

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

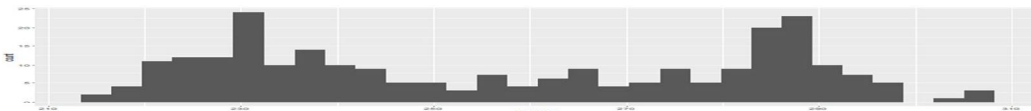
The **KURTOSIS** of the selected variable: -1.404501

Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. And is uniform distribution.



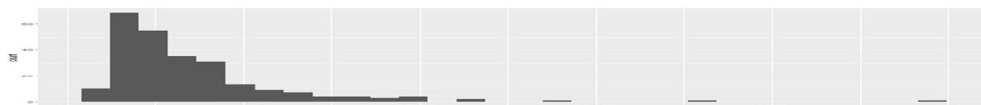
Close Price

Chart No: 5a



Interpretation: Statistical summary of the variable:

Min					1 st Quantity	Median	Mean	3 rd Quantity	Max
215.3	232.2	256.2	257.2	284.1	307.5				



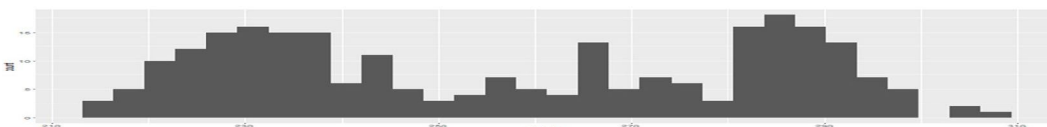
The **Skewness** of selected variable: 0.07878455. Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: -1.501859

Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported, and is uniform distribution.

Average Price

Chart No: 6a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
214.5	232.9	256.3	257.2	283.7	307.5

The **SKEWNESS** of selected variable: 0.0747952

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: -1.48428

Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. And is uniform distribution.



Interpretation: Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
412300	981200	134300	1759000	2070000	12290000

The **SKEWNESS** of selected variable: 3.429092

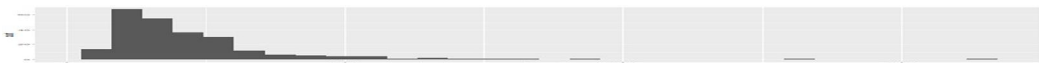
Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: 18.43769

Kurtosis greater than 3 are said to be leptokurtic which therefore produces more outliers than the normal distribution.

Turnover in Lakhs

Chart No: 8a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
976.3	2442.0	3516.0	4548.0	5465.0	32820.0

The **SKEWNESS** of selected variable: 3.63804

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: 20.12962

Kurtosis greater than 3 are said to be leptokurtic which therefore produces more outliers than the normal distribution.

Number of Trades

Chart No: 9a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
5643	14010	19470	22690	27980	11810

The **SKEWNESS** of selected variable: 2.567028

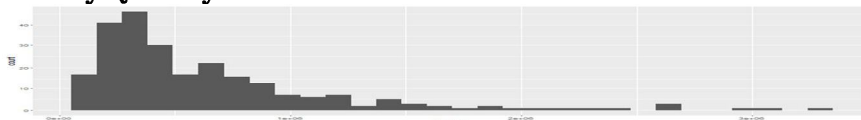


Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: 11.59825

Kurtosis greater than 3 are said to be leptokurtic which therefore produces more outliers than the normal distribution.

Delivery Quantity: Chart No: 10a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
85880	287200	454600	650700	793600	3273000

The **SKEWNESS** of selected variable: 2.150576

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The **KURTOSIS** of the selected variable: 5.2901

Kurtosis greater than 3 are said to be leptokurtic which therefore produces more outliers than the normal distribution.

% of Delivery Quantity to Traded Quantity Chart No: 11a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
12.35	26.56	33.72	35.16	41.01	77.15

The **SKEWNESS** of selected variable: 0.7070352

Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The kurtosis of the selected variable: 0.3764677



Kurtosis less than 3 are said to be platykurtic, although this does not imply the distribution is "flat-topped" as sometimes reported. And is uniform distribution.

Returns Chart No: 12a



Interpretation Statistical summary of the variable:

Min	1 st Quantity	Median	Mean	3 rd Quantity	Max
-0.059910	-0.0117600	-0.0006794	0.0007971	0.0120600	0.1312000

The **SKEWNESS** of selected variable: 0.8127248

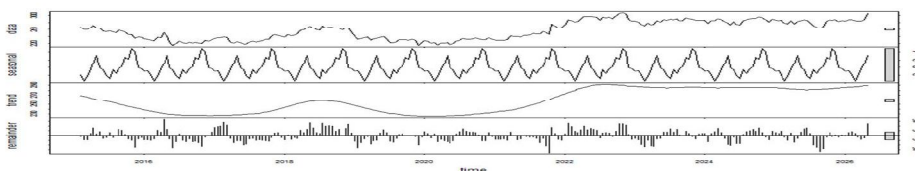
Positive skew indicates that the tail on the right side is longer or fatter than the left side. In cases where one tail is long but the other tail is fat, Skewness does not obey a simple rule.

The kurtosis of the selected variable: 4.177217

Kurtosis greater than 3 are said to be leptokurtic which therefore produces more outliers than the normal distribution.

Seasonality: The Seasonal Trend Decomposition using Loess (STL) is an algorithm that was developed to help to divide up a time series into three components namely: the trend, seasonality and remainder. The methodology was presented by Robert Cleveland, William Cleveland, Jean McRae and Irma Trepinning in the Journal of Official Statistics in 1990. The STL is available within R via the **stl** function. The use of the **stl** function can be demonstrated using one of the data sets available within the base R installation. The well-used nottem data set (Average Monthly Temperatures at Nottingham, 1920-1939) is a good starting point.

Chart No: 4a



Interpretation

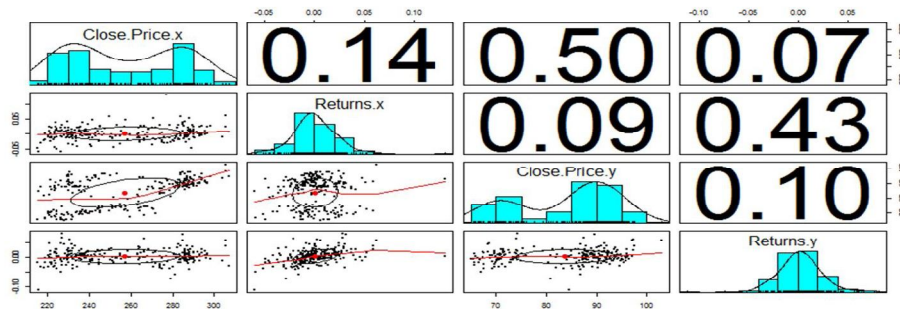
The four graphs are the original data, seasonal component, trend component and the remainder and this shows the periodic seasonal pattern extracted out from the original data and the trend that moves around between 230 and 290 degrees Fahrenheit. There is a bar at the right hand side of each graph to allow a relative comparison of the magnitudes of each component. For this data the change in trend is less than the variation doing to the monthly variation.



Bivariate

Scatter Plot Matrix: Scatterplot matrices are a great way to roughly determine if you have a linear correlation between multiple variables. This is particularly helpful in pinpointing specific variables that might have similar correlations to your genomic or proteomic data.

R comes with some various pre-saved datasets for practice. The data sets used here are the CLOSE PRICE and the RETURNS from the data summary.



Interpretation

In above mentioned graph the normal distribution for returns is perfect whereas the prices of close price are not normally distributed. The correlation for close price of TVS motors and Ashok Leyland is 0.50.

The correlation for returns of TVS motors and Ashok Leyland 0.43.

Autocorrelation: An autocorrelation plot shows the properties of a type of data known as a time series. A time series refers to observations of a single variable over a specified time horizon. For example, the daily price of Microsoft stock during the year 2013 is a time series. Cross-sectional data refers to observations on many variables at a single point in time. For example, the closing prices of the 30 stocks contained in the Dow Jones Industrial Average on January 31, 2014, would be considered cross-sectional data. An autocorrelation plot is designed to show whether the

elements of a time series are positively correlated, negatively correlated, or independent of each other. (The prefix auto means "self" autocorrelation specifically refers to correlation among the elements of a time series.) An autocorrelation plot shows the value of the autocorrelation function (acf) on the vertical axis. It can range from -1 to 1 . The horizontal axis of an autocorrelation plot shows the size of the between the elements of the time series.

Autocorrelation, also known as **serial correlation** or **cross-autocorrelation**, is the cross-correlation of a signal with itself at different points in time (that is what the cross stands for). Informally, it is the similarity between observations as a function of the time lag between them. It is a mathematical tool for finding repeating patterns, such as the presence of a periodic signal obscured by noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies.



The Autocorrelation plot below shows that the time series is random, but rather has a low degree of Autocorrelation between adjacent and near-adjacent observations. Plot is drawn from the RETURNS of TVS motors and ASHOK LAYLAND motors.
Chart No: 4.5.2a

Plot is drawn from the RETURNS of TVS motors and ASHOK LAYLAND motors.



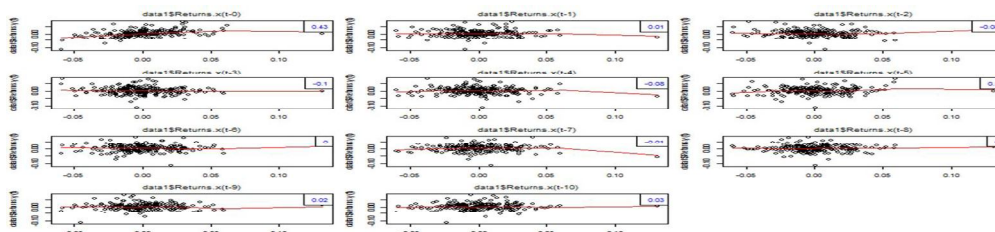
Interpretation

The autocorrelation at lag 0 is 0.43

Autocorrelation exists when the lagged line touches or crosses the blue dotted line.

There is no perfect autocorrelation in all the remaining lags except the 4th lag.

Lagged Correlations: Lagged relationships are characteristic of many natural physical systems. Lagged correlation refers to the correlations between two-time series shifted in time relative to one another. Lagged correlation is important in studying the relationship between time series for two reasons. First one series may have a delayed response to the other series, or perhaps a delayed response to a common stimulus that affects both series. Second, the response of one series to the other series or an outside stimulus may be “smeared” in time, such that a stimulus restricted to one observations elicits a response at multiple observations.



Interpretation

The above Lagged Correlation plot is drawn from the RETURNS of TVS motors and ASHOK LAYLAND motors, with frequency 10. In the graph t-(x): x indicates the lag and the blue colored number above each box is the correlation for the lagged graphs. The black dots are all the points taken from the returns of

both TVS motors and Ashok Leyland motors.

Findings: From the findings in the Plots we could find out the minimum value and maximum value of Previous Close, Open Price, High Price, Low Price, Last Price, Close Price, Average Price, Total Trade Quantity, Turnover in Lakhs, Number of



Trade, Deliverable Quantity, % of Deliverable Quantity by Traded Quantity, returns of the data summary of TVS motors taken for one year i.e; 23/3/2015 to 21/3/2016.

In the above findings we could find the histograms of Previous Close, Open Price, High Price, Low Price, Last Price, Close Price, Average Price, Total Trade Quantity, Turnover in Lakhs, Number of Trade, Deliverable Quantity, % of Deliverable Quantity by Traded Quantity, Returns with Mean, Median, Mode, Skewness and Kurtosis of the data summary of TVS motors taken for one year i.e; 23/3/2015 to 21/3/2016.

Suggestions: Seasonal Trend Decomposition using Loess (STL) is an algorithm that was developed to help to divide up a time series into three components namely: the trend, seasonality and remainder. The use of the stl function can be demonstrated using one of the data sets available within the base R installation. The four graphs are the original data, seasonal component, trend component and the remainder and this shows the periodic seasonal pattern extracted out from the original data and the trend that moves around between 230 and 290 degrees. In the bivariate findings there are three types Scatter Plot Matrix, Auto Correlation, Lagged Correlations. Hence a study of technical analysis on TVS Company share price suggests an increase in future share prices assuming there are not any abnormal factors impacting the market environment. Even though there are fluctuations in the TVS share prices they are at normal acceptable levels without major differences in the overall trend. Most of the technical indicator shows a major buying signal. Based on these results it is said that this the time for investors to go for investment in TVS Company.

However, the investors need to tread cautiously. The investment analysis on the company is only applicable for the long run i.e. at least for period of over 3 years. This is because, the rallies showing the short term period are below the zero lime that is a bearish signal and there are possibilities for the investor to lose in their investment. It is preferable to go for either medium or long period since the rallies represent there two periods are above zero line. TVS Company is one of those companies that investors believe, can be purchased at any level because they will hold it in their portfolios for the long term and are not concerned with trading it short term.

Conclusion: Plots are the graphs which helps us not only known the maximum and minimum value but also when the prices got inclined and declined. The Skewness and the Kurtosis generally will give us the pace of inclination and declination of the prices. Seasonality helps us with when the actual sales of the company are at hike. Bivariate will show us the difference between the two chosen companies. The only thing we do know is that stocks are volatile and can change in price extremely rapid. I conclude that the application 'R' is very useful for the financial analyst to not only do share price status check but also do various other things like prediction which will approximately be 99% correct.

Bibliography

- "An Introduction to statistical learning with Applications in 'R' , Gareth James , Daniela Witten , Trevor Hastie, Robert Tibshirani,2013, springer text publishers.

Websites

<http://www.bseindia.com/>



<http://www.investopedia.com>

<http://www.Stockcharts.com/>

<http://www.economicstimes.com>

<http://www.indiainfoline.com/>

<http://www.moneycontrol.com/>

<https://www.datacamp.com/courses/free-introduction-to-r/chapter-1-intro-to-basics-1-r>

https://en.wikipedia.org/wiki/Risk_management

https://en.wikipedia.org/wiki/TVS_Motor_Company